

**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing

(1) General information:

A total of 8 DNA sequences and 8 amino acid sequences.

(2) Information for pPA-GBP plasmid DNA sequence and His₆-protein A-GBP fusion protein sequence (seq. ID No. 1):

- (A) Length of plasmid- 5454 base pairs
- (B) Length of fusion protein- 257 amino acids
- (C) Number of sheets listing sequences- 4

(2) Information for pStreptavidin-GBP plasmid DNA sequence and His₆-streptavidin-GBP fusion protein sequence (Seq. ID No. 2):

- (A) Length of plasmid- 5448 base pairs
- (B) Length of fusion protein- 255 amino acids
- (C) Number of sheets listing sequences and information- 4

(2) Information for pPA-GBP-PA plasmid DNA sequence and His₆-protein A-GBP-protein A fusion protein sequence (Seq. ID No. 3):

- (A) Length of plasmid- 1182 base pairs
- (B) Length of fusion protein- 393 amino acids
- (C) Number of sheets listing sequences- 2

(2) Information for pstrept-GBP-streptavidin plasmid DNA sequence and His₆-streptavidin-GBP-streptavidin fusion protein sequence (Seq. ID No. 4):

- (A) Length of plasmid- 966 base pairs
- (B) Length of fusion protein- 322 amino acids
- (C) Number of sheets listing sequences- 2

(2) Information for pPA-GBP-streptavidin plasmid DNA sequence and His₆-protein A-GBP-streptavidin fusion protein sequence (Seq. ID No. 5):

- (A) Length of plasmid- 1176 base pairs
- (B) Length of fusion protein- 391 amino acids
- (C) Number of sheets listing sequences- 2

(2) Information for pStreptavidin-GBP-PA plasmid DNA sequence and His₆-streptavidin-GBP-protein A fusion protein sequence (Seq. ID No. 6):

- (A) Length of plasmid- 1176 base pairs
- (B) Length of fusion protein- 391 amino acids
- (C) Number of sheets listing sequences- 2

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Sequence Listing (continued)

- (2) Information for pGBP-plasmid DNA sequence and His₆-GBP fusion protein sequence (Seq. ID No. 7):
 - (A) Length of plasmid- 393 base pairs
 - (B) Length of fusion protein- 130 amino acids
 - (C) Number of sheets listing sequences- 1

- (2) Information for pGBP-GBP plasmid DNA sequence and His₆-GBP-GBP fusion protein sequence (Seq. ID. No. 8):
 - (A) Length of plasmid- 741 base pairs
 - (B) Length of fusion protein- 246 amino acids
 - (C) Number of sheets listing sequences- 2

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Sequence Listing- pPA-GBP plasmid-DNA and amino acid sequences *I.D. No. 1*

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1  CTCGAGAAAT CATAAAAAAT TTATTTGCTT TGTGAGCGGA TAACAATTAT
51  AATAGATTCA ATTGTGAGCG GATAACAATT TCACACAGAA TTCATTAAAG
101 AGGAGAAATT AACT ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA
      Met Arg Gly Ser His His His His His His Gly

148 TCC GGT TCT GGT GCG CAA CAC GAT GAA GCC GTA GAC AAC AAA TTC
      Ser Gly Ser Gly Ala Gln His Asp Glu Ala Val Asp Asn Lys Phe

193 AAC AAA GAA CAA CAA AAC GCG TTC TAT GAG ATC TTA CAT TTA CCT
      Asn Lys Glu Gln Gln Asn Ala Phe Tyr Glu Ile Leu His Leu Pro

238 AAC TTA AAC GAA GAA CAA CGA AAC GCC TTC ATC CAA AGT TTA AAA
      Asn Leu Asn Glu Glu Gln Arg Asn Ala Phe Ile Gln Ser Leu Lys

283 GAT GAC CCA AGC CAA AGC GCT AAC CTT TTA GCA GAA GCT AAA AAG
      Asp Asp Pro Ser Gln Ser Ala Asn Leu Leu Ala Glu Ala Lys Lys

328 CTA AAT GAT GCT CAG GCG CCG AAA GTA GAC AAC AAA TTC AAC AAA
      Leu Asn Asp Ala Gln Ala Pro Lys Val Asp Asn Lys Phe Asn Lys

373 GAA CAA CAA AAC GCG TTC TAT GAG ATC TTA CAT TTA CCT AAC TTA
      Glu Gln Gln Asn Ala Phe Tyr Glu Ile Leu His Leu Pro Asn Leu

418 AAC GAA GAA CAA CGA AAC GCC TTC ATC CAA AGT TTA AAA GAT GAC
      Asn Glu Glu Gln Arg Asn Ala Phe Ile Gln Ser Leu Lys Asp Asp

463 CCA AGC CAA AGC GCT AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT
      Pro Ser Gln Ser Ala Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn

508 GAT GCT CAG GCG CCG AAA GTA GAC GCG AAT TCG AGC TCT GGT AGT
      Asp Ala Gln Ala Pro Lys Val Asp Ala Asn Ser Ser Ser Gly Ser

553 GGC AAT GGT CAT ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT
      Gly Asn Gly His Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr

598 ATC CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC
      Ile Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile

643 CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG
      Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln

688 AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC
      Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser

733 ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
      Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

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Sequence Listing- pPA-GBP plasmid-DNA and amino acid sequences (continued) *L.D. No. 1*

778 CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT
His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His

823 GGA AAA ATT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT
Gly Lys Ile Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala

868 CTG TCC CTC GAG GGT CCG TAA TAAGCTTAAT TAGCTGAGCT TGGACTCCTG
Leu Ser Leu Glu Gly Pro ---

919 TTGATAGATC CAGTAATGAC CTCAGAACTC CATCTGGATT TGTTTCAGAAC
969 GCTCGGTTGC CGCCGGGCGT TTTTATTGG TGAGAATCCA AGCTAGCTTG
1019 GCGAGATTTT CAGGAGCTAA GGAAGCTAAA ATGGAGAAAA AAATCACTGG
1069 ATATACCACC GTTGATATAT CCCAATGGCA TCGTAAAGAA CATTTTGAGG
1119 CATTTCAGTC AGTTGCTCAA TGTACCTATA ACCAGACCGT TCAGCTGGAT
1169 ATTACGGCCT TTTTAAAGAC CGTAAAGAAA AATAAGCACA AGTTTTATCC
1219 GGCCTTTATT CACATTCTTG CCCGCCTGAT GAATGCTCAT CCGGAATTTT
1269 GTATGGCAAT GAAAGACGGT GAGCTGGTGA TATGGGATAG TGTTACCCCT
1319 TGTTACACCG TTTTCCATGA GCAAACCTGAA ACGTTTTTCAT CGCTCTGGAG
1369 TGAATACCAC GACGATTTCC GGCAGTTTCT ACACATATAT TCGCAAGATG
1419 TGGCGTGTTA CGGTGAAAAC CTGGCCTATT TCCCTAAAGG GTTTATTGAG
1469 AATATGTTTT TCGTCTCAGC CAATCCCTGG GTGAGTTTCA CCAGTTTTGA
1519 TTTAAACGTG GCCAATATGG ACAACTTCTT CGCCCCCGTT TTCACCATGG
1569 GCAAATATTA TACGCAAGGC GACAAGGTGC TGATGCCGCT GGCGATTGAG
1619 GTTCATCATG CCGTTTGTGA TGGCTTCCAT GTCGGCAGAA TGCTTAATGA
1669 ATTACAACAG TACTGCGATG AGTGGCAGGG CGGGGCGTAA TTTTTTTAAG
1719 GCAGTTATTG GTGCCCTTAA ACGCCTGGGG TAATGACTCT CTAGCTTGAG
1769 GCATCAAATA AAACGAAAGG CTCAGTCGAA AGACTGGGCC TTTCGTTTTTA
1819 TCTGTTGTTT GTCGGTGAAC GCTCTCCTGA GTAGGACAAA TCCGCCCTCT
1869 AGATTACGTG CAGTCGATGA TAAGCTGTCA AACATGAGAA TTGTGCCTAA
1919 TGAGTGAGCT AACTTACATT AATTGCGTTG CGCTCACTGC CCGCTTTCCA
1969 GTCGGGAAAC CTGTCGTGCC AGCTGCATTA ATGAATCGGC CAACGCGCGG
2019 GGAGAGGCGG TTTGCGTATT GGGCGCCAGG GTGGTTTTTC TTTTCACCAG
2069 TGAGACGGGC AACAGCTGAT TGCCCTTCAC CGCCTGGCCC TGAGAGAGTT
2119 GCAGCAAGCG GTCCACGCTG GTTTGCCCCA GCAGGCGAAA ATCCTGTTTG
2169 ATGGTGGTTA ACGGCGGGAT ATAACATGAG CTGTCTTCGG TATCGTCGTA
2219 TCCCCTACC GAGATATCCG CACCAACGCG CAGCCCGGAC TCGGTAATGG
2269 CGCGCATTGC GCCCAGCGCC ATCTGATCGT TGGCAACCAG CATCGCAGTG
2319 GGAACGATGC CCTCATTGAG CATTGTCATG GTTTGTTGAA AACCAGACAT
2369 GGCCTCCAG TCGCCTTCCC GTTCCGCTAT CGGCTGAATT TGATTGCGAG
2419 TGAGATATTT ATGCCAGCCA GCCAGACGCA GACGCGCCGA GACAGAAGTT
2469 AATGGGCCCC CTAACAGCGC GATTTGCTGG TGACCCAATG CGACCAGATG
2519 CTCCACGCCC AGTCGCGTAC CGTCTTCATG GGAGAAAATA ATACTGTTGA
2569 TGGGTGTCTG GTCAGAGACA TCAAGAAATA ACGCCGGAAC ATTAGTGCAG
2619 GCAGCTTCCA CAGCAATGGC ATCCTGGTCA TCCAGCGGAT AGTTAATGAT
2669 CAGCCCACTG ACGCGTTGCG CGAGAAGATT GTGCACCGCC GCTTTACAGG
2719 CTTTCGACGC GCTTCGTTCT ACCATCGACA CCACCACGCT GGCACCCAGT
2769 TGATCGGCGC GAGATTTAAT CGCCGCGACA ATTTGCGACG GCGCGTGCAG

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Sequence Listing- pPA-GBP plasmid-DNA and amino acid sequences (continued) 1.0. 10. 1

2819	GGCCAGACTG	GAGGTGGCAA	CGCCAATCAG	CAACGACTGT	TTGCCCCGCCA
2869	GTTGTTGTGC	CACGCGGTTG	GGAATGTAAT	TCAGCTCCGC	CATCGCCGCT
2919	TCCACTTTTT	CCCGCGTTTT	CGCAGAAACG	TGGCTGGCCT	GGTTCACCAC
2969	GCGGGAAACG	GTCTGATAAG	AGACACCGGC	ATACTCTGCG	ACATCGTATA
3019	ACGTTACTGG	TTTCACATTC	ACCACCCTGA	ATTGACTCTC	TTCCGGGCGC
3069	TATCATGCCA	TACCGCGAAA	GGTTTTGCAC	CATTTCGATG	TGTCGGAATT
3119	TCGGGCAGCG	TTGGGTCCTG	GCCACGGGTG	CGCATGATCT	AGAGCTGCCT
3169	CGCGCGTTTC	GGTGATGACG	GTGAAAACCT	CTGACACATG	CAGCTCCCGG
3219	AGACGGTCAC	AGCTTGTCTG	TAAGCGGATG	CCGGGAGCAG	ACAAGCCCGT
3269	CAGGGCGCGT	CAGCGGGTGT	TGGCGGGTGT	CGGGGCGCAG	CCATGACCCA
3319	GTCACGTAGC	GATAGCGGAG	TGTATACTGG	CTTAACTATG	CGGCATCAGA
3369	GCAGATTGTA	CTGAGAGTGC	ACCATATGCG	GTGTGAAATA	CCGCACAGAT
3419	GCGTAAGGAG	AAAATACCGC	ATCAGGCGCT	CTTCCGCTTC	CTCGCTCACT
3469	GACTCGCTGC	GCTCGGTTCG	TCGGCTGCGG	CGAGCGGTAT	CAGCTCACTC
3519	AAAGGCGGTA	ATACGGTTAT	CCACAGAATC	AGGGGATAAC	GCAGGAAAGA
3569	ACATGTGAGC	AAAAGGCCAG	CAAAAGGCCA	GGAACCGTAA	AAAGGCCGCG
3619	TTGCTGGCGT	TTTTCCATAG	GCTCCGCCCC	CCTGACGAGC	ATCACAAAAA
3669	TCGACGCTCA	AGTCAGAGGT	GGCGAAACCC	GACAGGACTA	TAAAGATACC
3719	AGGCGTTTCC	CCCTGGAAGC	TCCCTCGTGC	GCTCTCCTGT	TCCGACCCTG
3769	CCGCTTACCG	GATACCTGTC	CGCCTTTCTC	CCTTCGGGAA	GCGTGGCGCT
3819	TTCTCATAGC	TCACGCTGTA	GGTATCTCAG	TTCGGTGTAG	GTCGTTTCGT
3869	CCAAGCTGGG	CTGTGTGCAC	GAACCCCCCG	TTCAGCCCGA	CCGCTGCGCC
3919	TTATCCGGTA	ACTATCGTCT	TGAGTCCAAC	CCGGTAAGAC	ACGACTTATC
3969	GCCACTGGCA	GCAGCCACTG	GTAACAGGAT	TAGCAGAGCG	AGGTATGTAG
4019	GCGGTGCTAC	AGAGTTCTTG	AAGTGGTGGC	CTAACTACGG	CTACACTAGA
4069	AGGACAGTAT	TTGGTATCTG	CGCTCTGCTG	AAGCCAGTTA	CCTTCGGAAA
4119	AAGAGTTGGT	AGCTCTTGAT	CCGGCAAACA	AACCACCGCT	GGTAGCGGTG
4169	GTTTTTTTGT	TTGCAAGCAG	CAGATTACGC	GCAGAAAAAA	AGGATCTCAA
4219	GAAGATCCTT	TGATCTTTTC	TACGGGGTCT	GACGCTCAGT	GGAACGAAAA
4269	CTCACGTTAA	GGGATTTTGG	TCATGAGATT	ATCAAAAAGG	ATCTTCACCT
4319	AGATCCTTTT	AAATTAAAAA	TGAAGTTTTA	AATCAATCTA	AAGTATATAT
4369	GAGTAAACTT	GGTCTGACAG	TTACCAATGC	TTAATCAGTG	AGGCACCTAT
4419	CTCAGCGATC	TGTCTATTTT	GTTTCATCCAT	AGTTGCCTGA	CTCCCCGTCT
4469	TGTAGATAAC	TACGATACGG	GAGGGCTTAC	CATCTGGCCC	CAGTGCTGCA
4519	ATGATACCGC	GAGACCCACG	CTCACC GGCT	CCAGATTTAT	CAGCAATAAA
4569	CCAGCCAGCC	GGAAGGGCCG	AGCGCAGAAG	TGGTCCTGCA	ACTTTATCCG
4619	CCTCCATCCA	GTCTATTAAT	TGTTGCCGGG	AAGCTAGAGT	AAGTAGTTCT
4669	CCAGTTAATA	GTTTGCGCAA	CGTTGTTGCC	ATTGCTACAG	GCATCGTGGT
4719	GTCACGCTCG	TCGTTTGGTA	TGGCTTCATT	CAGCTCCGGT	TCCCAACGAT
4769	CAAGGCGAGT	TACATGATCC	CCCATGTTGT	GCAAAAAAGC	GGTTAGCTCC
4819	TTCGGTCCTC	CGATCGTTGT	CAGAAGTAAG	TTGGCCGCAG	TGTTATCACT
4869	CATGGTTATG	GCAGCACTGC	ATAATTCTCT	TACTGTCATG	CCATCCGTAA
4919	GATGCTTTTC	TGTGACTGGT	GAGTACTCAA	CCAAGTCATT	CTGAGAATAG
4969	TGTATGCGGC	GACCGAGTTG	CTCTTGCCCC	GCGTCAATAC	GGGATAATAC
5019	CGGCCACAT	AGCAGAACTT	TAAAAGTGCT	CATCATTGGA	AAACGTTCTT
5069	CGGGGCGAAA	ACTCTCAAGG	ATCTTACCGC	TGTTGAGATC	CAGTTCGATG
5119	TAACCCACTC	GTGCACCCAA	CTGATCTTCA	GCATCTTTTA	CTTTCACCAG

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Sequence Listing- pPA-GBP plasmid-DNA and amino acid sequences (continued) *Fig. 10*

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5169  CGTTTCTGGG TGAGCAAAAA CAGGAAGGCA AAATGCCGCA AAAAAGGGAA
5219  TAAGGGCGAC ACGGAAATGT TGAATACTCA TACTCTTCCT TTTTCAATAT
5269  TATTGAAGCA TTTATCAGGG TTATTGTCTC ATGAGCGGAT ACATATTTGA
5319  ATGTATTTAG AAAAATAAAC AAATAGGGGT TCCGCGCACA TTTCCCCGAA
5369  AAGTGCCACC TGACGTCTAA GAAACCATTA TTATCATGAC ATTAACCTAT
5419  AAAAATAGGC GTATCACGAG GCCCTTTCGT CTTTAC
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DNA sequence of the expression plasmid pPA-GBP. The amino acid sequence of the His₆-Protein A-GBP fusion protein is shown below the corresponding coding triplets. The amino acids corresponding to the His-tag and the linker regions are italicized and the Asn-Gly hydroxylamine cleavage site is bold-faced. The basic expression vector is pQE-80L, purchased from Qiagen. The coding sequence for the partial E domain and the two IgG-binding, synthetic Z domains of staphylococcal Protein A (Nilsson, *et al.*, *Protein Eng* 1:107-113, 1987) corresponding to nucleotides 160-528 is derived from the plasmid pEZZ18, purchased from Amersham. The coding sequence for GBP corresponding to nucleotides 565-858 is derived from plasmid pSB3053 obtained from Dr. S. Brown (Brown, *Nat Biotechnol* 15:269-272, 1997).

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Sequence Listing- pStreptavidin-GBP plasmid-DNA and amino acid sequences **I.D. No. 2**

```
1  CTCGAGAAAT CATAAAAAAT TTATTTGCTT TGTGAGCGGA TAACAATTAT
   51  AATAGATTCA ATTGTGAGCG GATAACAATT TCACACAGAA TTCATTAAAG
  101  AGGAGAAATT AACT ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC
      Met Arg Gly Ser His His His His His His Gly Ser

  151  GGT TCT GGT GGC CAT ATG GCT GAA GCT GGT ATC ACC GGC ACC TGG TAC
      Gly Ser Gly Gly His Met Ala Glu Ala Gly Ile Thr Gly Thr Trp Tyr

  199  AAC CAG CTG GGA TCC ACC TTC ATC GTT ACC GCT GGT GCT GAC GGT GCT
      Asn Gln Leu Gly Ser Thr Phe Ile Val Thr Ala Gly Ala Asp Gly Ala

  247  CTG ACC GGT ACC TAC GAA TCC GCT GTT GGT AAC GCT GAA TCT AGA TAC
      Leu Thr Gly Thr Tyr Glu Ser Ala Val Gly Asn Ala Glu Ser Arg Tyr

  295  GTT CTG ACC GGT CGT TAC GAC TCC GCT CCG GCT ACC GAC GGT TCC GGA
      Val Leu Thr Gly Arg Tyr Asp Ser Ala Pro Ala Thr Asp Gly Ser Gly

  343  ACC GCT CTG GGT TGG ACC GTT GCT TGG AAA AAC AAC TAC CGT AAC GCT
      Thr Ala Leu Gly Trp Thr Val Ala Trp Lys Asn Asn Tyr Arg Asn Ala

  391  CAC TCC GCT ACC ACC TGG TCT GGC CAG TAC GTT GGT GGT GCT GAA GCT
      His Ser Ala Thr Thr Trp Ser Gly Gln Tyr Val Gly Gly Ala Glu Ala

  439  CGT ATC AAC ACC CAG TGG TTG TTG ACC TCC GGC ACC ACC GAA GCT AAC
      Arg Ile Asn Thr Gln Trp Leu Leu Thr Ser Gly Thr Thr Glu Ala Asn

  487  GCG TGG AAA TCC ACC CTG GTT GGT CAC GAC ACC TTC ACC AAA GTT TCG
      Ala Trp Lys Ser Thr Leu Val Gly His Asp Thr Phe Thr Lys Val Ser

  535  AGC TCT GGT AGT GGC AAT GGT CAT ATG CAT GGA AAA ACT CAG GCA ACC
      Ser Ser Gly Ser Gly Asn Gly His Met His Gly Lys Thr Gln Ala Thr

  583  AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG
      Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly

  631  ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC
      Thr Ile Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile

  679  CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC
      Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser

  727  ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT
      Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His

  775  GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA
      Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys
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Sequence Listing- pStreptavidin-GBP plasmid-DNA & amino acid sequences (continued) *I.D. No. 2*

823 ATT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC CTC
Ile Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser Leu

871 GAG GGT CCG TAA TAAGCTTAAT TAGCTGAGCT TGGACTCCTG TTGATAGATC
Glu Gly Pro ---

923 CAGTAATGAC CTCAGAACTC CATCTGGATT TGTTCAGAAC GCTCGGTTGC
973 CGCCGGGCGT TTTTATTGG TGAGAATCCA AGCTAGCTTG GCGAGATTTT
1023 CAGGAGCTAA GGAAGCTAAA ATGGAGAAAA AAATCACTGG ATATACCACC
1073 GTTGATATAT CCCAATGGCA TCGTAAAGAA CATTGAGG CATTTCAGTC
1123 AGTTGCTCAA TGTACCTATA ACCAGACCGT TCAGCTGGAT ATTACGGCCT
1173 TTTTAAAGAC CGTAAAGAAA AATAAGCACA AGTTTTATCC GGCCTTTATT
1223 CACATTCTTG CCCGCCTGAT GAATGCTCAT CCGGAATTC GTATGGCAAT
1273 GAAAGACGGT GAGCTGGTGA TATGGGATAG TGTTACCCT GTTACACCG
1323 TTTTCCATGA GCAAACTGAA ACGTTTTTCAT CGCTCTGGAG TGAATACCAC
1373 GACGATTTCC GGCAGTTTCT ACACATATAT TCGCAAGATG TGGCGTGTTA
1423 CGGTGAAAC CTGGCCTATT TCCCTAAAGG GTTTATTGAG AATATGTTTT
1473 TCGTCTCAGC CAATCCCTGG GTGAGTTTCA CCAGTTTTGA TTTAAACGTG
1523 GCCAATATGG ACAACTTCTT CGCCCCCGTT TTCACCATGG GCAAATATTA
1573 TACGCAAGGC GACAAGGTGC TGATGCCGCT GGCGATTGAG GTTCATCATG
1623 CCGTTTGTGA TGGCTTCCAT GTCGGCAGAA TGCTTAATGA ATTACAACAG
1673 TACTGCGATG AGTGGCAGGG CGGGGCGTAA TTTTTTAAAG GCAGTTATTG
1723 GTGCCCTTAA ACGCCTGGGG TAATGACTCT CTAGCTTGAG GCATCAAATA
1773 AAACGAAAGG CTCAGTCGAA AGACTGGGCC TTTTCGTTTTA TCTGTTGTTT
1823 GTCGGTGAAC GCTCTCCTGA GTAGGACAAA TCCGCCCTCT AGATTACGTG
1873 CAGTCGATGA TAAGCTGTCA AACATGAGAA TTGTGCCTAA TGAGTGAGCT
1923 AACTTACATT AATTGCGTTG CGCTCACTGC CCGCTTTCCA GTCGGGAAAC
1973 CTGTCGTGCC AGCTGCATTA ATGAATCGGC CAACGCGCGG GGAGAGGCGG
2023 TTTGCGTATT GGGCGCCAGG GTGGTTTTTC TTTTCACCAG TGAGACGGGC
2073 AACAGCTGAT TGCCCTTAC CGCCTGGCCC TGAGAGAGTT GCAGCAAGCG
2123 GTCCACGCTG GTTTGCCCCA GCAGGCGAAA ATCCTGTTTG ATGGTGGTTA
2173 ACGGCGGGAT ATAACATGAG CTGTCTTCGG TATCGTCGTA TCCCACTACC
2223 GAGATATCCG CACCAACGCG CAGCCCGGAC TCGGTAATGG CGCGCATTCG
2273 GCCCAGCGCC ATCTGATCGT TGGCAACCAG CATCGCAGTG GGAACGATGC
2323 CCTCATTCAG CATTTGCATG GTTTGTTGAA AACCGGACAT GGCCTCCAG
2373 TCGCCTTCCC GTTCCGCTAT CGGCTGAATT TGATTGCGAG TGAGATATTT
2423 ATGCCAGCCA GCCAGACGCA GACGCGCCGA GACAGAACTT AATGGGCCCC
2473 CTAACAGCGC GATTGCTGG TGACCAATG CGACCAGATG CTCCACGCCC
2523 AGTCGCGTAC CGTCTTCATG GGAGAAAATA ATACTGTTGA TGGGTGTCTG
2573 GTCAGAGACA TCAAGAAATA ACGCCGGAAC ATTAGTGAG GCAGCTTCCA
2623 CAGCAATGGC ATCCTGGTCA TCCAGCGGAT AGTTAATGAT CAGCCCACTG
2673 ACGCGTTGCG CGAGAAGATT GTGCACCGCC GCTTTACAGG CTTCGACGCC
2723 GCTTCGTTCT ACCATCGACA CCACCACGCT GGCACCCAGT TGATCGGCGC
2773 GAGATTTAAT CGCCGCGACA ATTTGCGACG GCGCGTGCAG GGCCAGACTG
2823 GAGGTGGCAA CGCCAATCAG CAACGACTGT TTGCCCAGCA GTTGTGTGTC
2873 CACGCGTTTG GGAATGTAAT TCAGCTCCGC CATCGCCGCT TCCACTTTTT
2923 CCCGCGTTTT CGCAGAAACG TGGCTGGCCT GGTTCACCAC GCGGGAAACG
2973 GTCTGATAAG AGACACCGGC ATACTCTGCG ACATCGTATA ACGTTACTGG

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Sequence Listing- pStreptavidin-GBP plasmid-DNA & amino acid sequences (continued)

I. D. No. 2

3023	TTTCACATTC	ACCACCCTGA	ATTGACTCTC	TTCCGGGCGC	TATCATGCCA
3073	TACCGCGAAA	GGTTTTGCAC	CATTCGATGG	TGTCGGAATT	TCGGGCAGCG
3123	TTGGGTCTTG	GCCACGGGTG	CGCATGATCT	AGAGCTGCCT	CGCGCGTTTC
3173	GGTGATGACG	GTGAAAACCT	CTGACACATG	CAGCTCCCGG	AGACGGTCAC
3223	AGCTTGTCTG	TAAGCGGATG	CCGGGAGCAG	ACAAGCCCGT	CAGGGCGCGT
3273	CAGCGGGTGT	TGGCGGGTGT	CGGGGCGCAG	CCATGACCCA	GTCACGTAGC
3323	GATAGCGGAG	TGTATACTGG	CTTAACATATG	CGGCATCAGA	GCAGATTGTA
3373	CTGAGAGTGC	ACCATATGCG	GTGTGAAATA	CCGCACAGAT	GCGTAAGGAG
3423	AAAATACCGC	ATCAGGCGCT	CTTCCGCTTC	CTCGCTCACT	GACTCGCTGC
3473	GCTCGGTCTG	TCGGCTGCGG	CGAGCGGTAT	CAGCTCACTC	AAAGGCGGTA
3523	ATACGGTTAT	CCACAGAATC	AGGGGATAAC	GCAGGAAAGA	ACATGTGAGC
3573	AAAAGGCCAG	CAAAAGGCCA	GGAACCGTAA	AAAGGCCGCG	TTGCTGGCGT
3623	TTTTCCATAG	GCTCCGCCCC	CCTGACGAGC	ATCACAAAAA	TCGACGCTCA
3673	AGTCAGAGGT	GGCGAAACCC	GACAGGACTA	TAAAGATACC	AGGCGTTTCC
3723	CCCTGGAAGC	TCCCTCGTGC	GCTCTCCTGT	TCCGACCCTG	CCGCTTACCG
3773	GATACCTGTC	CGCCTTTCTC	CCTTCGGGAA	GCGTGGCGCT	TTCTCATAGC
3823	TCACGCTGTA	GGTATCTCAG	TTCGGTGTAG	GTCGTTGCTG	CCAAGCTGGG
3873	CTGTGTGCAC	GAACCCCCCG	TTCAGCCCGA	CCGCTGCGCC	TTATCCGGTA
3923	ACTATCGTCT	TGAGTCCAAC	CCGGTAAGAC	ACGACTTATC	GCCACTGGCA
3973	GCAGCCACTG	GTAACAGGAT	TAGCAGAGCG	AGGTATGTAG	GCGGTGCTAC
4023	AGAGTTCTTG	AAGTGGTGGC	CTAACTACGG	CTACACTAGA	AGGACAGTAT
4073	TTGGTATCTG	CGCTCTGCTG	AAGCCAGTTA	CCTTCGGAAA	AAGAGTTGGT
4123	AGCTCTTGAT	CCGGCAAACA	AACCACCGCT	GGTAGCGGTG	GTTTTTTTGT
4173	TTGCAAGCAG	CAGATTACGC	GCAGAAAAAA	AGGATCTCAA	GAAGATCCTT
4223	TGATCTTTTC	TACGGGGTCT	GACGCTCAGT	GGAACGAAAA	CTCACGTTAA
4273	GGGATTTTGG	TCATGAGATT	ATCAAAAAGG	ATCTTCACCT	AGATCCTTTT
4323	AAATTAAAAA	TGAAGTTTTA	AATCAATCTA	AAGTATATAT	GAGTAAACTT
4373	GGTCTGACAG	TTACCAATGC	TTAATCAGTG	AGGCACCTAT	CTCAGCGATC
4423	TGTCTATTTT	GTTTCATCCAT	AGTTGCCTGA	CTCCCCGTCG	TGTAGATAAC
4473	TACGATACGG	GAGGGCTTAC	CATCTGGCCC	CAGTGCTGCA	ATGATACCGC
4523	GAGACCCACG	CTCACCGGCT	CCAGATTTAT	CAGCAATAAA	CCAGCCAGCC
4573	GGAAGGGCCG	AGCGCAGAAG	TGGTCCTGCA	ACTTTATCCG	CCTCCATCCA
4623	GTCTATTAAT	TGTTGCCGGG	AAGCTAGAGT	AAGTAGTTTC	CCAGTTAATA
4673	GTTTGCGCAA	CGTTGTTGCC	ATTGCTACAG	GCATCGTGGT	GTCACGCTCG
4723	TCGTTTGGTA	TGGCTTCATT	CAGCTCCGGT	TCCCAACGAT	CAAGGCGAGT
4773	TACATGATCC	CCCATGTTGT	GCAAAAAAGC	GGTTAGCTCC	TTCGGTCCTC
4823	CGATCGTTGT	CAGAAGTAAG	TTGGCCGCAG	TGTTATCACT	CATGGTTATG
4873	GCAGCACTGC	ATAATTCTCT	TACTGTCATG	CCATCCGTAA	GATGCTTTTC
4923	TGTGACTGGT	GAGTACTCAA	CCAAGTCATT	CTGAGAATAG	TGTATGCGGC
4973	GACCGAGTTG	CTCTTGCCCC	GCGTCAATAC	GGGATAATAC	CGCGCCACAT
5023	AGCAGAACTT	TAAAAGTGCT	CATCATTGGA	AAACGTTCTT	CGGGGCGAAA
5073	ACTCTCAAGG	ATCTTACCGC	TGTTGAGATC	CAGTTCGATG	TAACCCACTC
5123	GTGCACCCAA	CTGATCTTCA	GCATCTTTTA	CTTTCACCAG	CGTTTCTGGG
5173	TGAGCAAAAA	CAGGAAGGCA	AAATGCCGCA	AAAAAGGGAA	TAAGGGCGAC
5223	ACGGAAATGT	TGAATACTCA	TACTCTTCCT	TTTTCAATAT	TATTGAAGCA
5273	TTTATCAGGG	TTATTGTCTC	ATGAGCGGAT	ACATATTTGA	ATGTATTTAG
5323	AAAAATAAAC	AAATAGGGGT	TCCGCGCACA	TTTCCCCGAA	AAGTGCCACC
5373	TGACGTCTAA	GAAACCATTA	TTATCATGAC	ATTAACCTAT	AAAAATAGGC
5423	GTATCACGAG	GCCCTTTCGT	CTTCAC		

**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pStreptavidin-GBP plasmid-DNA & amino acid sequences (continued)

I, D. No. 2

DNA sequence of the expression plasmid pStreptavidin-GBP. The amino acid sequence of the His₆-Streptavidin-GBP fusion protein is shown below the corresponding coding triplets. The amino acids corresponding to the His-tag and the linker regions are italicized and the Asn-Gly hydroxylamine cleavage site is bold-faced. The basic expression vector is pQE-80L purchased from Qiagen. The coding sequence for core streptavidin residues 13-133 of the mature polypeptide (Sano, *et al.*, *J Biol Chem* 270:28204-28209, 1995) corresponding to nucleotides 169-531 is derived from a plasmid obtained from Dr. P. Stayton (Chilkoti, *et al.*, *Proc Natl Acad Sci U S A* 92:1754-1758, 1995). The coding sequence for GBP corresponding to nucleotides 559-852 is derived from plasmid pSB3053 obtained from Dr. S. Brown (Brown, *Nat. Biotechnol.* 15:269-272, 1997).

**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**
Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pPA-GBP-PA plasmid- DNA and amino acid sequences of fusion protein only. Other DNA sequences not shown are identical to those shown in the complete sequence of plasmid pPA-GBP. I.D. No. 3

```

115  ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC GGT TCT GGT
      Met Arg Gly Ser His His His His His His Gly Ser Gly Ser Gly

160  GCG CAA CAC GAT GAA GCC GTA GAC AAC AAA TTC AAC AAA GAA CAA
      Ala Gln His Asp Glu Ala Val Asp Asn Lys Phe Asn Lys Glu Gln

205  CAA AAC GCG TTC TAT GAG ATC TTA CAT TTA CCT AAC TTA AAC GAA
      Gln Asn Ala Phe Tyr Glu Ile Leu His Leu Pro Asn Leu Asn Glu

250  GAA CAA CGA AAC GCC TTC ATC CAA AGT TTA AAA GAT GAC CCA AGC
      Glu Gln Arg Asn Ala Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser

295  CAA AGC GCT AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT GAT GCT
      Gln Ser Ala Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala

340  CAG GCG CCG AAA GTA GAC AAC AAA TTC AAC AAA GAA CAA CAA AAC
      Gln Ala Pro Lys Val Asp Asn Lys Phe Asn Lys Glu Gln Gln Asn

385  GCG TTC TAT GAG ATC TTA CAT TTA CCT AAC TTA AAC GAA GAA CAA
      Ala Phe Tyr Glu Ile Leu His Leu Pro Asn Leu Asn Glu Glu Gln

430  CGA AAC GCC TTC ATC CAA AGT TTA AAA GAT GAC CCA AGC CAA AGC
      Arg Asn Ala Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser Gln Ser

475  GCT AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT GAT GCT CAG GCG
      Ala Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala Gln Ala

520  CCG AAA GTA GAC GCG AAT TCG AGC TCT GGT AGT GGC AAT GGT CAT
      Pro Lys Val Asp Ala Asn Ser Ser Ser Gly Ser Gly Asn Gly His

565  ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
      Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

610  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT
      His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His

655  GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA
      Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly

700  AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA
      Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys

745  ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
      Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

790  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ATT CAG
      Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Ile Gln

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**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**

Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pPA-GBP-PA plasmid- DNA and amino acid sequences of fusion protein only. *I.D. No. 3*

```
835  GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC CTC GAG
      Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser Leu Glu

880  GGT GGC GGA TCC GGT TCT GGT GCG CAA CAC GAT GAA GCC GTA GAC
      Gly Gly Gly Ser Gly Ser Gly Ala Gln His Asp Glu Ala Val Asp

925  AAC AAA TTC AAC AAA GAA CAA CAA AAC GCG TTC TAT GAG ATC TTA
      Asn Lys Phe Asn Lys Glu Gln Gln Asn Ala Phe Tyr Glu Ile Leu

970  CAT TTA CCT AAC TTA AAC GAA GAA CAA CGA AAC GCC TTC ATC CAA
      His Leu Pro Asn Leu Asn Glu Glu Gln Arg Asn Ala Phe Ile Gln

1015 AGT TTA AAA GAT GAC CCA AGC CAA AGC GCT AAC CTT TTA GCA GAA
      Ser Leu Lys Asp Asp Pro Ser Gln Ser Ala Asn Leu Leu Ala Glu

1060 GCT AAA AAG CTA AAT GAT GCT CAG GCG CCG AAA GTA GAC AAC AAA
      Ala Lys Lys Leu Asn Asp Ala Gln Ala Pro Lys Val Asp Asn Lys

1105 TTC AAC AAA GAA CAA CAA AAC GCG TTC TAT GAG ATC TTA CAT TTA
      Phe Asn Lys Glu Gln Gln Asn Ala Phe Tyr Glu Ile Leu His Leu

1150 CCT AAC TTA AAC GAA GAA CAA CGA AAC GCC TTC ATC CAA AGT TTA
      Pro Asn Leu Asn Glu Glu Gln Arg Asn Ala Phe Ile Gln Ser Leu

1195 AAA GAT GAC CCA AGC CAA AGC GCT AAC CTT TTA GCA GAA GCT AAA
      Lys Asp Asp Pro Ser Gln Ser Ala Asn Leu Leu Ala Glu Ala Lys

1240 AAG CTA AAT GAT GCT CAG GCG CCG AAA GTA GAC GCG AAT TCG AGC
      Lys Leu Asn Asp Ala Gln Ala Pro Lys Val Asp Ala Asn Ser Ser

1285 TCT GGT GGC TAA
      Ser Gly Gly ---
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**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**

Inventor Richard G. Woodbury -phone# 206-235-3435

Sequence Listing- Strept-GBP-Streptavidin plasmid- DNA and amino acid sequences of fusion protein only. Other DNA sequences not shown are identical to those shown in the complete sequence of plasmid pStreptavidin-GBP. *I.p. No 4*

115 ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC GGT TCT
Met Arg Gly Ser His His His His His His Gly Ser Gly Ser

157 GGT GGC CAT ATG GCT GAA GCT GGT ATC ACC GGC ACC TGG TAC
Gly Gly His Met Ala Glu Ala Gly Ile Thr Gly Thr Trp Tyr

199 AAC CAG CTG GGA TCC ACC TTC ATC GTT ACC GCT GGT GCT GAC
Asn Gln Leu Gly Ser Thr Phe Ile Val Thr Ala Gly Ala Asp

241 GGT GCT CTG ACC GGT ACC TAC GAA TCC GCT GTT GGT AAC GCT
Gly Ala Leu Thr Gly Thr Tyr Glu Ser Ala Val Gly Asn Ala

283 GAA TCT AGA TAC GTT CTG ACC GGT CGT TAC GAC TCC GCT CCG
Glu Ser Arg Tyr Val Leu Thr Gly Arg Tyr Asp Ser Ala Pro

325 GCT ACC GAC GGT TCC GGA ACC GCT CTG GGT TGG ACC GTT GCT
Ala Thr Asp Gly Ser Gly Thr Ala Leu Gly Trp Thr Val Ala

367 TGG AAA AAC AAC TAC CGT AAC GCT CAC TCC GCT ACC ACC TGG
Trp Lys Asn Asn Tyr Arg Asn Ala His Ser Ala Thr Thr Trp

409 TCT GGC CAG TAC GTT GGT GGT GCT GAA GCT CGT ATC AAC ACC
Ser Gly Gln Tyr Val Gly Gly Ala Glu Ala Arg Ile Asn Thr

451 CAG TGG TTG TTG ACC TCC GGC ACC ACC GAA GCT AAC GCG TGG
Gln Trp Leu Leu Thr Ser Gly Thr Thr Glu Ala Asn Ala Trp

493 AAA TCC ACC CTG GTT GGT CAC GAC ACC TTC ACC AAA GTT TCG
Lys Ser Thr Leu Val Gly His Asp Thr Phe Thr Lys Val Ser

535 AGC TCT GGT AGT GGC AAT GGT CAT ATG CAT GGA AAA ACT CAG
Ser Ser Gly Ser Gly Asn Gly His Met His Gly Lys Thr Gln

577 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

619 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

661 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

703 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**
Inventor Richard G. Woodbury –phone# 206-235-3435

Sequence Listing- pStrept-GBP-Strept plasmid- DNA and amino acid sequences of
fusion protein only (continued). *I. D. No. 4*

745 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

787 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ATT CAG
Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Ile Gln

829 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC CTC
Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser Leu

871 GAG GGA TCT GGT TCT GGT GGC CAT ATG GCT GAA GCT GGT ATC
Glu Gly Ser Gly Ser Gly Gly His Met Ala Glu Ala Gly Ile

913 ACC GGC ACC TGG TAC AAC CAG CTG GGA TCC ACC TTC ATC GTT
Thr Gly Thr Trp Tyr Asn Gln Leu Gly Ser Thr Phe Ile Val

955 ACC GCT GGT GCT GAC GGT GCT CTG ACC GGT ACC TAC GAA TCC
Thr Ala Gly Ala Asp Gly Ala Leu Thr Gly Thr Tyr Glu Ser

997 GCT GTT GGT AAC GCT GAA TCT AGA TAC GTT CTG ACC GGT CGT
Ala Val Gly Asn Ala Glu Ser Arg Tyr Val Leu Thr Gly Arg

1039 TAC GAC TCC GCT CCG GCT ACC GAC GGT TCC GGA ACC GCT CTG
Tyr Asp Ser Ala Pro Ala Thr Asp Gly Ser Gly Thr Ala Leu

**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**

Inventor Richard G. Woodbury -phone# 206-235-3435

Sequence Listing- pPA-GBP-Streptavidin plasmid- DNA and amino acid sequences of fusion protein only. Other DNA sequences not shown are identical to those shown in the complete sequence of plasmid pPA-GBP. *I, D. No. 5*

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115  ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC GGT TCT GGT
    Met Arg Gly Ser His His His His His His Gly Ser Gly Ser Gly

160  GCG CAA CAC GAT GAA GCC GTA GAC AAC AAA TTC AAC AAA GAA CAA
    Ala Gln His Asp Glu Ala Val Asp Asn Lys Phe Asn Lys Glu Gln

205  CAA AAC GCG TTC TAT GAG ATC TTA CAT TTA CCT AAC TTA AAC GAA
    Gln Asn Ala Phe Tyr Glu Ile Leu His Leu Pro Asn Leu Asn Glu

250  GAA CAA CGA AAC GCC TTC ATC CAA AGT TTA AAA GAT GAC CCA AGC
    Glu Gln Arg Asn Ala Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser

295  CAA AGC GCT AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT GAT GCT
    Gln Ser Ala Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala

340  CAG GCG CCG AAA GTA GAC AAC AAA TTC AAC AAA GAA CAA CAA AAC
    Gln Ala Pro Lys Val Asp Asn Lys Phe Asn Lys Glu Gln Gln Asn

385  GCG TTC TAT GAG ATC TTA CAT TTA CCT AAC TTA AAC GAA GAA CAA
    Ala Phe Tyr Glu Ile Leu His Leu Pro Asn Leu Asn Glu Glu Gln

430  CGA AAC GCC TTC ATC CAA AGT TTA AAA GAT GAC CCA AGC CAA AGC
    Arg Asn Ala Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser Gln Ser

475  GCT AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT GAT GCT CAG GCG
    Ala Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala Gln Ala

520  CCG AAA GTA GAC GCG AAT TCG AGC TCT GGT AGT GGC AAT GGT CAT
    Pro Lys Val Asp Ala Asn Ser Ser Ser Gly Ser Gly Asn Gly His

565  ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
    Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

610  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT
    His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His

655  GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA
    Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly

700  AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA
    Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys

745  ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
    Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

790  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ATT CAG
    Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Ile Gln
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**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**

Inventor Richard G. Woodbury -phone# 206-235-3435

Sequence Listing- pPA-GBP-Streptavidin plasmid- DNA and amino acid sequences of
fusion protein only (continued). *I.D. No. 5*

835	GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC CTC GAG
	Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser Leu Glu
880	GGA TCT GGT TCT GGT GGC CAT ATG GCT GAA GCT GGT ATC ACC GGC
	Gly Ser Gly Ser Gly Gly His Met Ala Glu Ala Gly Ile Thr Gly
925	ACC TGG TAC AAC CAG CTG GGA TCC ACC TTC ATC GTT ACC GCT GGT
	Thr Trp Tyr Asn Gln Leu Gly Ser Thr Phe Ile Val Thr Ala Gly
970	GCT GAC GGT GCT CTG ACC GGT ACC TAC GAA TCC GCT GTT GGT AAC
	Ala Asp Gly Ala Leu Thr Gly Thr Tyr Glu Ser Ala Val Gly Asn
1015	GCT GAA TCT AGA TAC GTT CTG ACC GGT CGT TAC GAC TCC GCT CCG
	Ala Glu Ser Arg Tyr Val Leu Thr Gly Arg Tyr Asp Ser Ala Pro
1060	GCT ACC GAC GGT TCC GGA ACC GCT CTG GGT TGG ACC GTT GCT TGG
	Ala Thr Asp Gly Ser Gly Thr Ala Leu Gly Trp Thr Val Ala Trp
1105	AAA AAC AAC TAC CGT AAC GCT CAC TCC GCT ACC ACC TGG TCT GGC
	Lys Asn Asn Tyr Arg Asn Ala His Ser Ala Thr Thr Trp Ser Gly
1150	CAG TAC GTT GGT GGT GCT GAA GCT CGT ATC AAC ACC CAG TGG TTG
	Gln Tyr Val Gly Gly Ala Glu Ala Arg Ile Asn Thr Gln Trp Leu
1195	TTG ACC TCC GGC ACC ACC GAA GCT AAC GCG TGG AAA TCC ACC CTG
	Leu Thr Ser Gly Thr Thr Glu Ala Asn Ala Trp Lys Ser Thr Leu
1240	GTT GGT CAC GAC ACC TTC ACC AAA GTT TCG AGC TCA AGC TTA ATT
	Val Gly His Asp Thr Phe Thr Lys Val Ser Ser Ser Ser Leu Ile
1285	AGC TGA
	Ser ---

**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**

Inventor Richard G. Woodbury -phone# 206-235-3435

Sequence Listing- Streptavidin-GBP-PA plasmid- DNA and amino acid sequences of fusion protein only. Other DNA sequences not shown are identical to those shown in the complete sequence of plasmid pPA-GBP. *U.S. No. 6*

115 ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC GGT TCT
Met Arg Gly Ser His His His His His His Gly Ser Gly Ser

157 GGT GGC CAT ATG GCT GAA GCT GGT ATC ACC GGC ACC TGG TAC
Gly Gly His Met Ala Glu Ala Gly Ile Thr Gly Thr Trp Tyr

199 AAC CAG CTG GGA TCC ACC TTC ATC GTT ACC GCT GGT GCT GAC
Asn Gln Leu Gly Ser Thr Phe Ile Val Thr Ala Gly Ala Asp

241 GGT GCT CTG ACC GGT ACC TAC GAA TCC GCT GTT GGT AAC GCT
Gly Ala Leu Thr Gly Thr Tyr Glu Ser Ala Val Gly Asn Ala

283 GAA TCT AGA TAC GTT CTG ACC GGT CGT TAC GAC TCC GCT CCG
Glu Ser Arg Tyr Val Leu Thr Gly Arg Tyr Asp Ser Ala Pro

325 GCT ACC GAC GGT TCC GGA ACC GCT CTG GGT TGG ACC GTT GCT
Ala Thr Asp Gly Ser Gly Thr Ala Leu Gly Trp Thr Val Ala

367 TGG AAA AAC AAC TAC CGT AAC GCT CAC TCC GCT ACC ACC TGG
Trp Lys Asn Asn Tyr Arg Asn Ala His Ser Ala Thr Thr Trp

409 TCT GGC CAG TAC GTT GGT GGT GCT GAA GCT CGT ATC AAC ACC
Ser Gly Gln Tyr Val Gly Gly Ala Glu Ala Arg Ile Asn Thr

451 CAG TGG TTG TTG ACC TCC GGC ACC ACC GAA GCT AAC GCG TGG
Gln Trp Leu Leu Thr Ser Gly Thr Thr Glu Ala Asn Ala Trp

493 AAA TCC ACC CTG GTT GGT CAC GAC ACC TTC ACC AAA GTT TCG
Lys Ser Thr Leu Val Gly His Asp Thr Phe Thr Lys Val Ser

535 AGC TCT GGT AGT GGC AAT GGT CAT ATG CAT GGA AAA ACT CAG
Ser Ser Gly Ser Gly Asn Gly His Met His Gly Lys Thr Gln

577 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

619 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

661 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

703 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**

Inventor Richard G. Woodbury -phone# 206-235-3435

Sequence Listing- Streptavidin-GBP-PA plasmid- DNA and amino acid sequences of
fusion protein only (continued). *I. D. No. 6*

745 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG
Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln

787 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ATT CAG
Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Ile Gln

829 GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC CTC
Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser Leu

871 GAG GGT GGC GGA TCC GGT TCT GGT GCG CAA CAC GAT GAA GCC
Glu Gly Gly Gly Ser Gly Ser Gly Ala Gln His Asp Glu Ala

913 GTA GAC AAC AAA TTC AAC AAA GAA CAA CAA AAC GCG TTC TAT
Val Asp Asn Lys Phe Asn Lys Glu Gln Gln Asn Ala Phe Tyr

955 GAG ATC TTA CAT TTA CCT AAC TTA AAC GAA GAA CAA CGA AAC
Glu Ile Leu His Leu Pro Asn Leu Asn Glu Glu Gln Arg Asn

997 GCC TTC ATC CAA AGT TTA AAA GAT GAC CCA AGC CAA AGC GCT
Ala Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser Gln Ser Ala

1039 AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT GAT GCT CAG GCG
Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala Gln Ala

1081 CCG AAA GTA GAC AAC AAA TTC AAC AAA GAA CAA CAA AAC GCG
Pro Lys Val Asp Asn Lys Phe Asn Lys Glu Gln Gln Asn Ala

1123 TTC TAT GAG ATC TTA CAT TTA CCT AAC TTA AAC GAA GAA CAA
Phe Tyr Glu Ile Leu His Leu Pro Asn Leu Asn Glu Glu Gln

1165 CGA AAC GCC TTC ATC CAA AGT TTA AAA GAT GAC CCA AGC CAA
Arg Asn Ala Phe Ile Gln Ser Leu Lys Asp Asp Pro Ser Gln

1207 AGC GCT AAC CTT TTA GCA GAA GCT AAA AAG CTA AAT GAT GCT
Ser Ala Asn Leu Leu Ala Glu Ala Lys Lys Leu Asn Asp Ala

1249 CAG GCG CCG AAA GTA GAC GCG AAT TCG AGC TCT GGT GGC TAA
Gln Ala Pro Lys Val Asp Ala Asn Ser Ser Ser Gly Gly ---

**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**
Inventor Richard G. Woodbury -phone# 206-235-3435

Sequence Listing- pGBP plasmid- DNA and amino acid sequences of fusion protein only.
Other DNA sequences not shown are identical to those shown in the complete sequence
of plasmid pPA-GBP. I.D. No. 7

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115  ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC GGA GGT GGG AGC
    Met Arg Gly Ser His His His His His His Gly Ser Gly Gly Gly Ser

163  TCT GGT AGT GGC AAT GGT CAT ATG CAT GGA AAA ACT CAG GCA ACC AGC
    Ser Gly Ser Gly Asn Gly His Met His Gly Lys Thr Gln Ala Thr Ser

211  GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT
    Gly Thr Ile Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr

259  ATC CAG AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG
    Ile Gln Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln

307  AGC ATG CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
    Ser Met His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

355  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA
    His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly

403  AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ATT
    Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Ile

451  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC CTC GAG
    Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser Leu Glu

499  GGT CCG TAA
    Gly Pro ---
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**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**
Inventor Richard G. Woodbury -phone# 206-235-3435

Sequence Listing- pGBP-GBP plasmid- DNA and amino acid sequences of fusion protein only. Other DNA sequences not shown are identical to those shown in the complete sequence of plasmid pPA-GBP. *I.D. No. 8*

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115  ATG AGA GGA TCG CAT CAC CAT CAC CAT CAC GGA TCC GGA GGT
    Met Arg Gly Ser His His His His His His Gly Ser Gly Gly

157  GGG AGC TCT GGT AGT GGC AAT GGT CAT ATG CAT GGA AAA ACT
    Gly Ser Ser Gly Ser Gly Asn Gly His Met His Gly Lys Thr

199  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
    Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

241  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
    Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

283  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
    Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

325  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
    Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

367  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ACT
    Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Thr

409  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GGA AAA ATT
    Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Gly Lys Ile

451  CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG CAT GCT CTG TCC
    Gln Ala Thr Ser Gly Thr Ile Gln Ser Met His Ala Leu Ser

493  CTC GAG GGT GGT GGA AGC TCT GGT AGT GGC AAT GGT CAT ATG
    Leu Glu Gly Gly Gly Ser Ser Gly Ser Gly Asn Gly His Met

535  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
    His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

577  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
    His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

619  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
    His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

661  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
    His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

703  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
    His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

745  CAT GGA AAA ACT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
    His Gly Lys Thr Gln Ala Thr Ser Gly Thr Ile Gln Ser Met
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**RECOMBINANT FUSION PROTEINS WITH HIGH AFFINITY
BINDING TO GOLD AND APPLICATIONS THEREOF**

Inventor Richard G. Woodbury -phone# 206-235-3435

Sequence Listing- pGBP-GBP plasmid- DNA and amino acid sequences of fusion protein
only (continued). *I.O. No. 8*

787 CAT GGA AAA ATT CAG GCA ACC AGC GGG ACT ATC CAG AGC ATG
His Gly Lys Ile Gln Ala Thr Ser Gly Thr Ile Gln Ser Met

829 CAT GCT CTG TCC CTC GAG GGT CCG TAA
His Ala Leu Ser Leu Glu Gly Pro ---